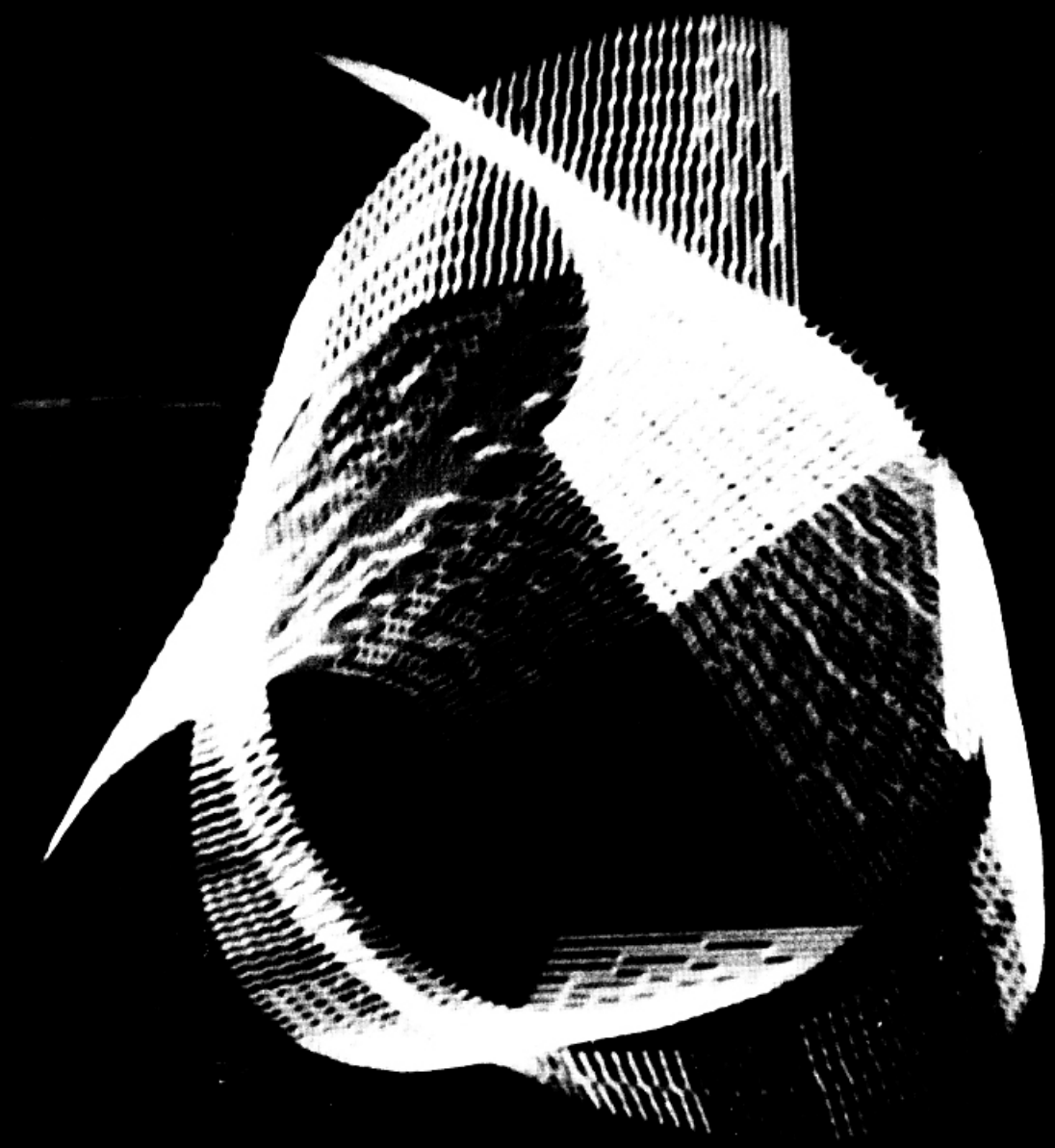
COMPUTER GRAPHICS AND ART



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THE MAGAZINE OF INTERDISCIPLINARY COMPUTER GRAPHICS FOR PROFESSIONAL GRAPHICS PEOPLE AND COMPUTER ARTISTS

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3 - EDITORIAL - MAKE DO WITH WHAT YOU HAVE by Grace C. Hertlein

4 - INTERACTIVE, DYNAMIC, COMPUTER ART by Dick Land and Dan Cohen, Harvard University, Cambridge, Mass. The "Flower" system generates unpredictable dynamic patterns that are dependent upon operator interaction. Dynamic, moving forms are displayed on a CRT.

8 - ART OF THE SPACE ERA by Carolyn Wood. Curator of the Huntsville Museum of art - Excerpts from Catalog I.

9 - ADVERTISEMENT, ELSEVIER NORTH-HOLLAND, INC. UNTITLED TRANSFORMATION by Sture Johannesson and Sten Kallin, Malmo Sweden - Illustration only.

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11 - ALGORITHMIC ART OF THE SPACE ERA by Peter Milojevic, Toronto, Canada - Graphic and comments, ASE Show.

12 - SNE COMP ART: A SOFTWARE PACKAGE FOR CREATIVE PROBLEMS BY GRAPHIC DATA PROCESSING by Hans Korneder, Munich, Germany
A "user-oriented" system, SNE COMP ART, from the University of Munich is presented in depth. The basic elements, basic structure, and arrangements of forms are discussed and illustrated well.

16 - HIEROGLYPHS by Aaron Marcus, Jerusalem, Israel - Illustrations and comments are given by the artist on his glyph-like works.

18 - THE TECHNOLOGY OF EACH ERA by Lillian Schwartz and C. B. Rubenstein, Watchung, New Jersey - Illustration and philosophy by Lillian Schwartz - ASE Exhibition.

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An experiment, using 10 related graphics, is tested on art teachers. Analyses of results are given in detail, with statistical manipulations.

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32 - VARIED ATTITUDES HELD TOWARD COMPUTER ART by Professors Paul Shao and Ken Dunker, Iowa State University - Graphic and comments, from the ASE Exhibition.

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36 - FLOWERS by Dick Land and Dan Cohen, Harvard University.

EDITORIAL

MAKE DO WITH WHAT YOU HAVE

Recently several incidents have recalled the idea of "making do with what you have." Too often there is the mistaken idea that one must have very expensive hardware and software to achieve innovative graphics. Here are some examples:

THE NEEDS OF SMALL INSTITUTIONS

I was preparing an invitational paper for a computer conference of small colleges. The conference leader asked me to suggest ideas that these small institutions could afford to achieve graphics. The idea came readily to mind: "Make do with what you have. Don't wish for the moon."

THE NEED FOR AWARENESS BY STUDENTS

I was lecturing and demonstrating art graphics to a group of students in an advanced software class. They were bemoaning the lack of complex animation equipment. In discussing their current research, I found that many of them were re-inventing the wheel, repeating experiments that were already available on our campus. They had failed to assess what was available. When they were told that such routines were already in existence, they replied, "Oh, I was interested in the theory. It doesn't matter if I repeat what someone else has already done."

However, if more students were aware of what has been done, they could use their fine talents to take previous research and add improvements, to render these systems available for new users, etc.

THE NEED FOR INTEGRATION OF FACILITIES, SOFTWARE

It is becoming increasingly common for institutions to hire a special coordinator for instructional computing. Some common needs are: teaching teachers how to compute; coordinating programs that are available; securing needed software; planning new hardware, etc.

I talked with such a coordinator a few weeks ago. He enthusiastically expounded on grand plans for expensive new hardware. I listened for some time, and then said:

- Do you know what we already have available?
- Have we ascertained that existing materials and facilities are being fully used?
- Are we making use of knowledgeable people on our own campus?
- Have we ascertained what programs we can get free of charge from our own system?
- Have we investigated to find out what we can obtain from our regional computer consortium?
- Have we researched what is available from national organizations, as EDUCOM and CONDUIT?
- Have we planned specific workshops for special groups of people?

RE-INVENTION OF THE WHEEL

Repeatedly at national and international conferences we see research that is identical with previous discoveries. Professors are not the only persons who fail to review the literature. Intermediate and advanced students are too often guilty of the same practice.

There is something more important here than ignorance, ego, or immaturity. It is the lack of objective study and thinking about the work of others. Too often we accept authorities as minor gods, and do not question openly what has been accomplished -- and do not appreciate sufficiently what has been done. This is intellectual immaturity.

KNOW WHAT IS AVAILABLE

The valuable resources of many institutions are wasted because systems are locked up (for the privileged use of specific users). Making full use of facilities is mandatory for any institution.

Information on facilities and available software is not openly advertised for potential users. Information is often poorly organized for varied types of users.

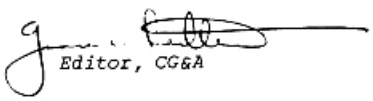
GOING BEYOND WHAT YOU HAVE

After making sure that what is available is well used, there is an innovative place, where one can get hardware and software to do things beyond their original intent or scope. For example, many institutions do "pseudo" animation on storage tube CRTs. Many small schools only have printer graphic capabilities. Many groups do not have plotters and utilize hard copy units from CRTs until they can afford to buy other hardware.

After innovatively using what is available, it is sensible to have expansion plans, wisely knowing what is affordable, and what works, particularly in a student environment, where equipment must be "student proof". Often it is necessary to learn to write good feasibility studies, in order to get the new hardware and software.

Computer graphics is like the art of great cooking. A superb cook can make a marvelous meal from almost nothing. A mediocre cook requires only expensive, rare ingredients.

It will be some time before microfilm and frame buffer systems are affordable by many institutions. In the meantime, we can achieve innovative works with what we have, what we can afford, and what we can procure -- in the near future.



Editor, CG&A

SNE COMP ART: A SOFTWARE PACKAGE FOR CREATIVE PROBLEMS BY GRAPHIC DATA PROCESSING

by Hans Korneder
Waldschulstr. 69
8000 Munich 82
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INTRODUCTION

The possibilities of applying graphic data processing have multiplied within the last dozen years. While in the beginning, problems were often purely mathematical (the representation of functions), today the applications of data processing with graphic output are to be found in an extremely large number of fields. Computer graphics are playing an increasingly important role in many applications. The following are just a few examples: town-planning research, textile patterns, meteorological maps -- or moving processes, as the simulation of flight, the reproduction of microorganisms, or even cartoons and films.

However, it is not hardware alone, whose applications have facilitated this development, but the fact that software packages have been developed, by which even more complex problems can be represented and treated more readily for the user.

The software package SNE COMP ART discussed in this article is to be applied mainly in the artistic and creative fields. It is based on the didactic plan for practical computer graphics by Professor Reiner Schneeberger, instructor of Computer Graphics at the University of Munich. The fundamental characteristics of the system were outlined in an article, "Computer Graphics at the University of Munich", published in this periodical in November, 1976.

The system was first used during the summer semester of 1976 at the University of Munich. During the course of the lectures, participants used the software package to execute computer graphics and computer films. As stated in the earlier article, participants were expected to achieve computer graphics after the first class meeting. Readers are urged to review this article as further background.

STRUCTURE OF THE GRAPHIC SYSTEM, SNE COMP ART

The software package, SNE COMP ART, consists of FORTRAN subroutines. They are to be called, either as functions, by allocation with an "equal-sign", or as real subroutines by "CALL".

FORTRAN was chosen as the programming language, for it guarantees a greater compatibility between computers from different manufacturers. In addition, for elementary programming, the users need not learn additional materials, as is often the case with special graphic languages.

The program modules are connected with the graphic output equipment over the two vector graphic routines, MOVETO and DRAWTO. By means of these simple interfaces, the packages of SNE COMP ART can be installed on the various computers without additional adaptation expenditures.

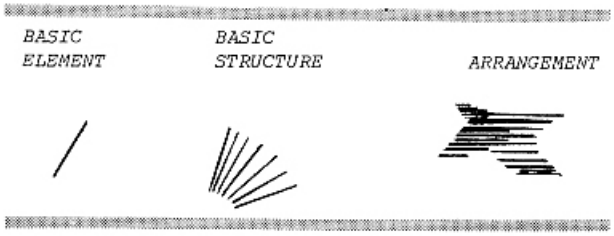
The modules are able to produce graphics that differ in complexity, as well as constructiveness (or casualness) of the figures produced.

DESCRIPTION AND ILLUSTRATIONS OF THE SUBROUTINES

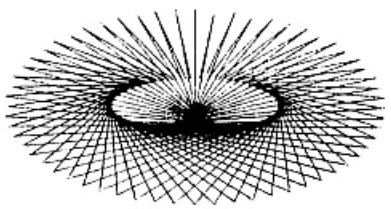
In the following section, the subroutines are briefly explained. The subroutine, its basic element, its basic structure and sample arrangements are illustrated within each descriptive section. Sample illustrations are given for the varied subroutines.

I. SNELLY

SNELLY is the most constructive routine and has no control of casualness. Thus extremely appealing drawings can be reproduced constantly when the parameters are familiar. The calls effect that two fragments of an ellipse are fixed, between which corresponding points are connected by the basic element, the vectors. The suitable parameter can produce a "moire effect", and when drawing several picture elements (that is, straight lines, one upon the other), a secondary pattern emerges, a so-called super-imposed drawing. This is the reason for the casualness, or the unpredictability of this module -- even the slightest parametric variation will cause the super-imposed drawing to appear in a completely different shape.



SNELLY -- SINGLE CALL

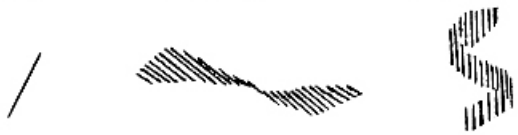


SNELLY -- WITHIN LOOP

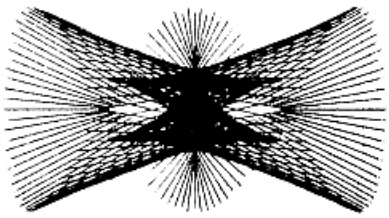
II. SNELIS

As in SNELLY, here also the basic element of the drawing is a basic line; however, the principal difference is to be found in the initial figures. Here cross connections can be drawn among the lissajous figures. Therefore, SNELIS performs an exact enlargement of SNELLY. The quantity of new graphics that can be achieved has been multiplied, as compared to SNELLY.

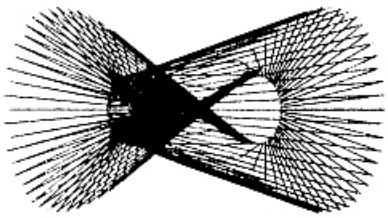
BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*



SNELIS -- SINGLE CALL



2ND VARIATION - SNELIS -- SINGLE CALL

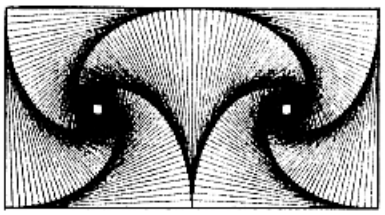


NOTE: On these pages, the works illustrated here very closely resemble graphics achieved via mathematics. Here the artist can readily utilize mathematics to output personal art.

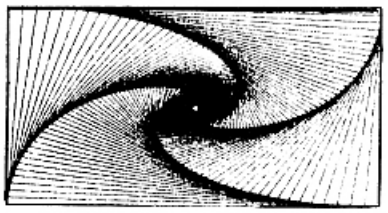
III. SNELIN

In this routine the line performs the basic element. It is, however, not a sequence of uninterrupted sketches, but the line is drawn along the edges of a previously defined polygon, scaling it down dynamically. The immediate associated or imagined connection of the respective corners evokes the impression that the polygons are revolving. This very charming effect is to be seen in almost every picture generated with SNELIN.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*



ABOVE: SNELIN -- DOUBLE CALL



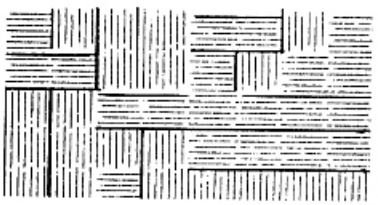
SECOND ILLUSTRATION: SNELIN -- SINGLE CALL

Using an art-designed system, the artist no longer needs to learn complex programming in order to achieve fine art graphics. Using such a system, the artist can bring more design, more of his manual capacities to this new art form.

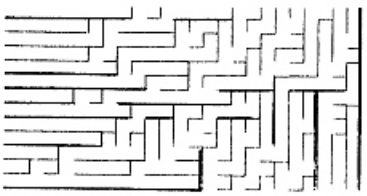
IV. SNEKAO

A certain number of parallel, horizontal or vertical lines are the basic element in this routine. Here the alternate grouping into horizontal or vertical blocks is the variable factor. A random generator decides on the grouping. Data concerning the share of frequency of the basic structures restrict its decisions. A variation of these parameters can produce adjusted structures. Due to the flat aspect of the basic structure, the resultant picture is of a two-dimensional character.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*



ABOVE: SNEKAO -- SINGLE CALL
BELOW: SNEKAO -- DOUBLE CALL



V. SNEWIS

The basic structure of SNEWIS is similar to that of SNEKAO. The possibility of determining additionally the cross-hatching angle of the rectangles performs the enlargement in this case. SNEWIS is an exact enlargement of SNEKAO and offers a multiple of SNEKAO's possibilities.

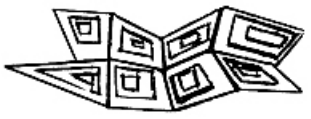
BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*

VI. SNEZNT

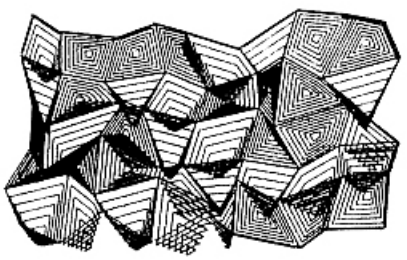
The graphic routine SNEZNT is based on a more complex basic figure, when compared with the routines discussed so far. In the basic element, any number of telescoped quadrangles can be drawn, which can be centered at will -- and can differ from the input rectangle in any intensity desired. However, the basic element of this routine (as well as every other one) can be arranged as often as desired in any direction. This aspect of the system, which may appear to be very casual, can be controlled very effectively, since all the dispersion is limitable. Inputting with only simple parameters with SNEZNT, very high-quality graphics can be produced. For example, by choosing suitable data, the impression of a creased foil can be achieved, with a striking plastic effect of the telescoped quadrangles.

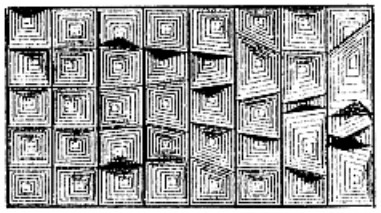
BASIC ELEMENT *BASIC STRUCTURE*

ARRANGEMENT



BELOW: SNEZNT -- SINGLE CALL USE



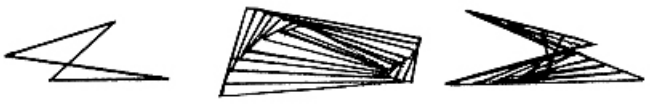


ABOVE: SNEZNT -- WITHIN LOOP
Again, notice how these routines afford complex graphics without requiring programming expertise by the user.

VII. SNEBID

SNEBID is the first routine to be less likely to control. Like SNELIN and SNEBID, it works with a continuous line, which connects the corners of the polygons according to their order. The only difference between SNELIN and SNEBID lies in the location of the polygon's corners. In the case of SNEBID this is made by a random generator and can be limited only to a certain interval on the resultant drawing.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*

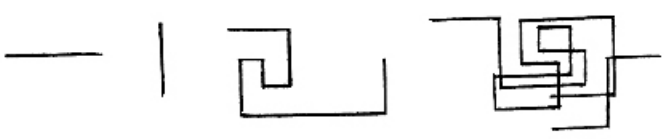


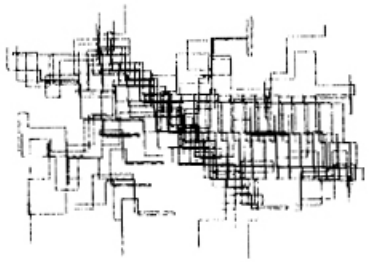
BELOW: SNEBID -- SINGLE CALL

VIII. SNERKT

The basic element of this routine is also the single line. It is drawn by means of a rectangle generator over a previously set part of the sheet. This means that the single segments of this stroke run horizontally or vertically and turn off at right angles, according to a specific length (or parameter) that is set.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*



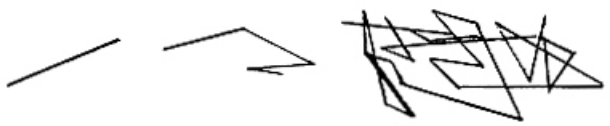


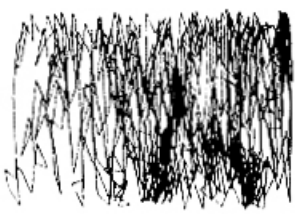
ABOVE: SNERKT -- WITHIN LOOP
How many variations can one achieve? Almost an unlimited number may be executed.

IX. SNEBRW

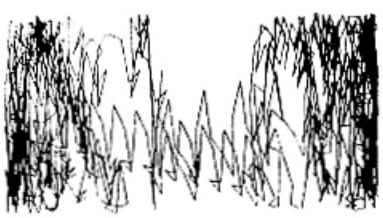
SNEBRW is an enlargement of SNERKT. The conditions of the right-angled turn of the line are eliminated in this case. This causes a primarily confusing course of the stroke, that looks like the "brownian" movement. Suitable data for the random generators can introduce a symmetry into the picture, which reduces its complexity in a way that allows the viewer easier interpretations of the given work.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*





ABOVE: SNEBRW -- SINGLE CALL



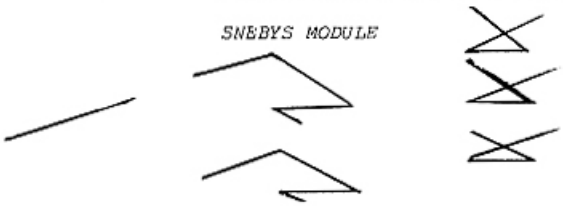
ABOVE: SNEBRW -- SINGLE CALL VARIATION

X. AND XI. SNEBXS AND SNEBYS

These routines control the graphic output of SNEBRW. The casual line of SNEBRW can be repeated in the direction of the X or Y axis as often as desired. The distance of the displacement can not only be chosen in the linear way, but can also be calculated by an internal dynamic parametric variation. There is the additional possibility of choosing only partial segments for the drawing.

BASIC ELEMENT *BASIC STRUCTURE* *ARRANGEMENT*

SNEBYS MODULE



XII. THE RANDOM GENERATORS IN SNE COMP ART

All modules of the SNE COMP ART system, which need rates of casualness (or randomness) are based on the three principal generators SNEZUF, SNERAD, and SNERGA. Of course, all the random generators are available to the user of this specific software package. These generators are explained briefly in the following paragraphs.

1. GENERATOR SNEZUF - The generator SNEZUF provides normally arranged random data, which can be limited to an interval at will through the setting of specific parameters.

2. GENERATOR SNERAD - This generator provides (like SNEZUF) normally arranged random data, which additionally, can repeat after a period, controlled by specific parameters.

3. GENERATOR SNERGA - This generator provides random numbers, whose share of frequency corresponds to the Gaussian normal parabola.

XIII. MODULE SNERUD

This subroutine selects "at random" a datum among an inputted number of data.

XIV. SNERRT

This module places back all random generators to their initial data. The application of this module is extremely important for the production of a sequence of pictures in which each time, the following picture is based on the preceding one. This is particularly useful for computer films.

XV. SNERIN

This subroutine changes the starting data of the generators. The application of this module is extremely interesting for the "impossibility of reproduction" -- and the personal touch of a graphic. Birth dates, for example, or similar data are recommended as input parameters in this case.

SUMMARY

With the availability of systems designed specifically for artist use, the state of the art of computer graphics should be advanced greatly. SNE COMP ART is an example of such a user-oriented system. The planning by Professor Reiner Schneeberger should prove invaluable to artists.